REMARKS

This application has been reviewed in light of the Office Action dated January 19, 2005. In view of the foregoing amendments and the following remarks, favorable reconsideration and withdrawal of the rejections set forth in the Office Action are respectfully requested.

Claims 1-40 and 43-58 are pending. Claims 55 and 56 have been amended to attend to formal matters. Claims 1, 21, 43 and 55-58 are in independent form.

Claims 1, 7 , 9, 18-21, 27, 29, 38-40, 43, 48 and 54-58 were rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 6,374,221 (*Haimi-Cohen*).

Claims 2-6, 22-26 and 44-47 were rejected under 35 U.S.C. § 103(a) as being unpatentable over *Haimi-Cohen* in view of *Rajan et al.* (IEEE Publication (cited in the Information Disclosure Statement filed on May 22, 2002)).

Claim 8, 12-14, 16, 17, 28, 32-34, 36, 37, 49 and 51-53 were rejected under 35 U.S.C. § 103(a) as being unpatentable over *Haimi-Cohen* in view of U.S. Patent No. 6,324,502 (*Handel et al.*).

Claims 15 and 35 were rejected under 35 U.S.C. § 103(a) as being unpatentable over *Haimi-Cohen* in view of *Handel et al.* and further in view of *Rajan et al.*

Claims 10, 11, 30, 31 and 50 were rejected under 35 U.S.C. § 103(a) as being unpatentable over *Haimi-Cohen* in view of U.S. Patent No. 5,507,037 (*Bartkowiak et al.*).

Applicants respectfully traverse these rejections.

Independent claim 1 recites, *inter alia*, a memory for storing a predetermined function which gives, for a given set of audio signal values, a probability density for parameters

of a predetermined speech model which is assumed to have generated the set of audio signal values, the probability density defining, for a given set of model parameter values, the probability that the predetermined speech model has those parameter values, given that the speech model is assumed to have generated the set of audio signal values; means for applying a set of received audio signal values (representative of an input audio signal) to the stored function to give the probability density for the model parameters for the set of received audio signal values; means for processing the function with the set of received audio signal values applied to obtain values of the parameters that are representative of the input audio signal; and means for detecting the presence of speech using the obtained parameter values.

Each of independent Claims 21, 43 and 55-58 includes elements identical or similar to the above-noted elements of Claim 1.

The Office Action contends that the above-noted elements of Claim 1 are taught by col. 7, line 32 - col. 8, line 20 and element 52 in Fig. 5 of *Haimi-Cohen.* However, Applicants respectfully disagree with this contention and submit that, for at least the reasons set forth below, Claim 1 is patentable over *Haimi-Cohen.*

Haimi-Cohen describes a system for automatically retraining a speech recognizer during normal use. As with most speech recognition systems, the input speech signal is compared with a set of word models each representative of a different word. By comparing the input speech with the stored models, the system can "recognize" the words that have been spoken by identifying the word models most similar to the input speech. The particular word models that are used by *Haimi-Cohen* are Hidden Markov Models (HMMs). As is described by *Haimi-Cohen* (see Fig. 7) an HMM models speech as a sequence of states. Each state represents a

portion of a spoken word and models the acoustic features that occur in that portion of the word. The probability of a portion of input speech (i.e., a frame) matching a state of the HMM is usually defined by a Gaussian probability function of the following form:

$$P(X_i) = (2\pi\sigma^2)^{-\frac{N}{2}} \exp\left[\frac{-(X_i-\mu)^T(X_i-\mu)}{2\sigma^2}\right]$$

where μ is the mean vector of the Gaussian distribution for that state; σ is the variance of the distribution; N is the dimension of the input feature vector; and X_i is the i^{th} feature vector in the input utterance. The mean vector and the variance for the state are determined during a training session in which known speech is modeled. In the subsequent recognition phase, the unknown speech (defined by the sequence of feature vectors X_i) is then applied to the Gaussian distributions of the different states of the Hidden Markov Models. As the mean vector and the variance of each HMM distribution are known, when the input speech feature vector (X_i) is applied to the distribution, a <u>scalar value</u> is obtained representing the probability that that feature vector corresponds to that state of that HMM. The obtained probability values are then combined with other probability values obtained by applying other feature vectors of the input utterance to the Gaussian distributions of other states of the model, to give a score representing the similarity between a sequence of the input feature vectors and the Hidden Markov Model.

As will be apparent from the above discussion, the Gaussian distributions that form part of the Hidden Markov Models are very different from the claimed function.

In particular, Claim 1 recites that a function is stored which generates a <u>probability density function</u> when a set of audio signal values is applied to it. In contrast, when

the speech signal values are applied to the Hidden Markov Model distributions of *Haimi-Cohen*, a scalar value is obtained. It will be appreciated that a scalar value is not the same as a probability density function.

Therefore, contrary to what the Office Action has suggested, *Haimi-Cohen* does not teach or suggest the means for applying the set of received audio signal values to the stored function to give the probability density for the model parameters for the set of received audio signal values, claimed in Claim 1. Furthermore, since in *Haimi-Cohen* a probability density function is not generated when the set of received audio signal values is applied to the function, *Haimi-Cohen* cannot be said to teach or suggest the means for processing the function with the set of received audio signal values applied to obtain values of the parameters that are representative of the input audio signal, or the means for detecting the presence of speech using the obtained parameter values, claimed in Claim 1.

In further regard to the claimed means for detecting the presence of speech using the obtained parameter values, the Office Action cites the speech activity detector 52 shown in Fig. 5 of *Haimi-Cohen* as corresponding to that means. However, as shown in that figure, the speech activity detector 52 operates before the matching unit 53, which matches the speech with the HMM models. Therefore, on the Office Action's interpretation of *Haimi-Cohen*, the speech activity detector 52 operates before the speech is applied to the stored function (the stored HMMs) and therefore does not detect speech using parameter values obtained by applying the input speech to those models.

Applicant submits that *Haimi-Cohen* does not teach or suggest an apparatus according to Claim 1 for at least the reasons set forth above. Applicant further submits that the

other independent claims herein are not taught or suggested by *Haimi-Cohen* for at least the same reasons as pertain to independent Claim 1.

Applicant further submits that none of the other art cited in the Office Action, taken alone or in combination, compensates for the deficiencies of *Haimi-Cohen* with respect to the independent claims.

Accordingly, Applicant submits that the independent claims herein are patentable over the cited art.

A review of the other art of record has failed to reveal anything which, in Applicant's opinion, would remedy the deficiencies of the art discussed above, as references against the independent claims herein. Those claims are therefore believed patentable over the art of record.

The other claims are each dependent from one or another of the independent claims. Without conceding the propriety of the rejections of the dependent claims, Applicant submits that the dependent claims are patentable for at least the same reasons as pertain to the independent claims. Since each dependent claim is also deemed to define an additional aspect of the invention, however, the individual reconsideration of the patentability of each on its own merits is respectfully requested.

In view of the foregoing amendments and remarks, Applicant respectfully requests favorable reconsideration, withdrawal of the §§ 102 and 103 rejections, and early passage to issue of the present application.

REQUEST FOR CONSIDERATION OF PREVIOUSLY-FILED INFORMATION DISCLOSURE STATEMENTS

It is noted that Applicant has not yet received from the Examiner initialed copies of the Forms PTO-1449 submitted with the Information Disclosure Statements filed on March 23, 2004, August 11, 2004, September 30, 2004 and January 18, 2005. Accordingly, Applicant respectfully requests that the Examiner consider the art cited in those IDS's and return initialed copies of the Forms PTO-1449 submitted therewith indicating that the art cited therein has been considered.

Applicant's undersigned attorney may be reached in our Washington, D.C. office by telephone at (202) 530-1010. All correspondence should continue to be directed to our below-listed address.

Respectfully submitted,

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